Andrew Axley
UCLA
Mentor: Wim Leemans

Project title: Interferometry of laser and discharge produced plasmas.

Project description: Development of advanced acceleration and radiation generation concepts based on laser-plasma accelerators.
Intern's role: Under supervision of a work lead, assist with setting up experimental systems to diagnose plasmas produced by lasers or capillary discharges.

Intern can expect to learn: The intern will learn valuable knowledge on laser-plasma interaction physics, experimental skills that involve the use of lasers and general laboratory skills. These will contribute to his education and allow him to make an informed decision on the direction he wants to go in for graduate school.

Luis Catane
College of San Mateo

Mentor: Biwu Ma

Project title: Organic Solar Cells Based on Solution Processable Pigment Materials

Project description: Solar cells are among the most promising technologies for the renewable clean energy. However, conventional silicon-based solar cells are too expensive to be implemented into our everyday life. Organic solar cells (OSCs) have substantial future prospects due to their low cost in both materials and device fabrications, ca. roll-to-roll printing abundant carbon-based materials. Driven by the continuous development of new materials, processing techniques and advanced device concepts, the power conversion efficiencies of OSCs has been steadily improved to the 6-8% range. Despite those achievements, there are still many issues, i.e. efficiency, lifetime, stability, etc., which need to be addressed before OSCs can be widely utilized. To realize OSCs with efficiencies exceeding 10%, the proposed research will focus on the development of new photo-/electro-active soft materials, the real control on morphology leading to ideal donor/acceptor nanophase separation, and the fundamental understanding of device operation. The materials of great potential are based on light absorbing organic pigments, which have been widely used in plastic coloration and paints. This project aims to make these low-cost, non-toxic, abundant and stable materials suitable for solar cells application.

Intern's role: The intern will be working on the device fabrication and testing aspect. Devices will be fabricated to develop a fundamental understanding of the structure-device performance relationship of the pigment based OSCs. The device performance characteristics of a single cell, including the open circuit voltage, the short circuit current density, the fill factor and the external quantum efficiency will be evaluated. These results will be correlated to the film properties including light absorption, charge carrier mobility, exciton diffusion length and energy diagram. The feedback provided by device work would offer design guidelines for the synthesis of better performance materials, whose morphological/electronic properties are tuned by the changing of molecular structures.

What the intern can expect to learn: Fundamentals of solar cells, knowledge about organic electronic materials, skills in electronic devices fabrication and testing, techniques in materials characterization.

Zachary Cordero
Massachusetts Institute of Technology

Mentor: Yuegang Zhang, Materials Sciences

Project Title: Nanostructured metal oxide/C composite materials for energy storage

Project Description: Many metal oxides are excellent electrode materials for pseudocapacitors and high-capacity anode materials for rechargeable LIBs. But they suffer from poor reversibility and slow kinetics during charge and discharge. Currently, there are several reports about using variety methods to synthesize this metal oxides and also use them as anode for batteries, But most of the methods are complicated and also involving the utilization of harmful chemicals. The electrochemical performance is also not so good. This project will focused on preparation of MoO3 and MnO2 nanostructures or MeOx/C nanocomposites via various techniques, such as chemical vapor deposition (CVD) and electrospinning. Synthesis and integration of carbon nanotubes or graphene materials will also be part of the project. The synthesized materials will be characterized by XRD, Raman, SEM, and other spectroscopic methods. Electrochemical measurements will be performed to evaluate their performance as anodes for rechargeable lithium-ion batteries.

Intern's role: Conduct experiment to prepare metal oxide and its carbon

composite; Assist postdoc to characterize the materials; Perform electro chemical measurement of assembled supercapacitor or battery cells.

Tyler Harvey
Whitman College

Mentor: Jeffrey Neaton, Materials Sciences [MSMFT]

Project Description: This is a position working in Dr. Jeffrey Neaton's group of LBNL's Material Sciences Division. Dr. Neaton's group uses theory and computation to study the electronic structure of and dynamical phenomena in nanomaterials, including light absorption and charge transfer in systems relevant to solar energy conversion. This project involves performing simulations to understand how fuels might be produced from sunlight. This effort will be part of the Helios Solar Energy Research Center at LBNL, a DOE program aimed at the realization of large-scale artificial photosynthesis with nanostructures. The specific project will involve working with an experimental group to understand recent measurements of photoinduced chemical reactions involving small molecules in silica nanopores.

What Intern Can Expect To Learn: Tyler can expect to learn about supercomputing platforms and state-of-the-art large scale molecular dynamics codes. These codes will be used to model dynamics and structure in nanostructures related to photon-induced chemical reactions.

Michelle Nguyen
UC Berkeley

Mentor: Carolyn Larabell, Physical Biosciences

Project title: An X-Ray and Fluorescence microscope investigation of Bacillus subtilis (B.s) germination developmental events.

Project description: This will be a continuation of the Summer SULI project. She will be further investigating the developmental processed involved in B.s. germination. Specific experiments will target the role of Zn sequestration and the location and morphology of the bacterial chromosome using ALS beamlines (X-Ray microscope and potentially one other). In addition she will be doing widefield fluorescence deconvolution microscopy of B.s cells in Ruzin's lab in Koshland Hall on campus to corroborate ALS findings.

John Rominger-Watts

UC Berkeley

Mentor: Carl Haber, Physics

A project title: Development of Position Sensitive Detector Arrays for the CERN Collider Upgrade

A project description: In this project we are developing large detector arrays which integrate electrical, mechanical, and thermal components into a precision low mass structure. These will be used for the tracker upgrade of the ATLAS detector at the CERN Large Hadron Collider.

What the intern's role will be: the intern will work in the lab on electrical testing and characterization of these devices.

What the intern can expect to learn: the intern will learn about the physics and technology of semiconductor radiation detectors, data acquistion and analysis, and programming of FPGA devices.